22/04/17

Maxima & Minima

TYPE-2

$x + \frac{1}{x}$ → minimum value = 2

$x > 0$

$n + \frac{1}{n}$ = max = -2

$n < 0$

Q. Find minimum value :-

Q. $\left(x^2 + \frac{1}{x^2}\right) + \frac{1}{(x^2+1)} = ?$ min = 2

Q. $x^2 + \frac{1}{x^2+1} + 3 = ?$

$x^2 + 1 + \frac{1}{x^2+1} + 2 \Rightarrow 2 + 2 = 4$

Q. $x^2 + \frac{1}{x^2} - 3 = ? \Rightarrow 2 - 3 = -1$

Q. $x^2 + \frac{1}{x^2+1} - 7 = ? \Rightarrow x^2 + 1 + \frac{1}{x^2+1} - 8 \Rightarrow 2 - 8 = -6$

Q. $x^2 + \frac{1}{x^2} + 2 = ? \Rightarrow 2 + 2 = 4$

Q. $x^2 + \frac{1}{x^2-1} + 2 = ? \Rightarrow x^2 - 1 + \frac{1}{x^2-1} + 3 \Rightarrow 2 + 3 = 5$

MATHS BY DP SINGH (KD CAMPUS)

Scanned by CamScanner

Find min. value -

$$\frac{(a^2+a+1)(b^2+b+1)(c^2+c+1)(d^2+d+1)}{abcd} = ?$$

$$\Rightarrow \left(a+1+\frac{1}{a}\right)\left(b+1+\frac{1}{b}\right)\left(c+1+\frac{1}{c}\right)\left(d+1+\frac{1}{d}\right)$$

$$\Rightarrow (2+1)\ (2+1)\ (2+1)\ (2+1)$$

$$\Rightarrow 3 \times 3 \times 3 \times 3 = 81$$

TYPE-2

$\boxed{x+\frac{1}{x}}$ → maximum value = -2

$\boxed{x < 0}$

Que: if $a+b=6$, find max. value of $ab = ?$

$\Rightarrow 3+3=6$

$3 \times 3 = 9$

(same value is maximum value)

$a+b$
$2*4 = 8$
$5*1 = 5$
$3*3 = 9 \rightarrow$ max

Que: if $a+b+c=6$ find the max value of $abc = ?$

$2 \times 2 \times 2 = 8$ Ans

Que: $a+b+c+d = 1$, find max. value $(ab+bc+cd+da) = ?$

MATHS BY DP SINGH (KD CAMPUS)

Scanned by CamScanner

$\left(\frac{1}{4}\times\frac{1}{4}\right)\left(\frac{1}{4}\times\frac{1}{4}\right)\left(\frac{1}{4}\times\frac{1}{4}\right)\left(\frac{1}{4}\times\frac{1}{4}\right) = \frac{1}{16}*\frac{1}{16}*\frac{1}{16}*\frac{1}{16} = \frac{4}{16} = \frac{1}{4}$ Ans.

Que: $a+b+c+d=1$. find max. value $(1+a)(1+b)(1+c)(1+d)$ = ?

$\left(1+\frac{1}{4}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{4}\right) \Rightarrow \frac{5}{4}\times\frac{5}{4}\times\frac{5}{4}\times\frac{5}{4} = \frac{625}{256}$ Ans OR $\left(\frac{5}{4}^4\right)$ Ans

Que: $ab=12$ find min value of $a+b$ = ?

$1\times12 = 12$
$2\times6 = 8$
$3+4 = 7$

min value = $3+4 = 7$ $(7)^2 = 49$

$\Rightarrow \sqrt{12}\times\sqrt{12}$

$\Rightarrow 2\sqrt{3}\times 2\sqrt{3}$ $\Rightarrow$ add $\Rightarrow 2\sqrt{3}+2\sqrt{3} = 4\sqrt{3}$.

Square to all options :- $(4\sqrt{3})^2 = 16\times3 = 48$

Que: $\underbrace{(a+1)}_{3}\ \underbrace{(b-1)}_{3}\ \underbrace{c}_{3} = 27$ find the min. value of $a+b+c$ = ?
(If they are in multiple)

$\Rightarrow$ $a+1=3$ $\quad b-1=3$ $\quad c=3$
$a=2$ $\quad b=4$

$2+4+3 = 9$ Ans

Que: $\underbrace{(a+1)}_{11}\ \underbrace{(b-3)}_{11}\ \underbrace{(c+4)}_{11} = 1331$ find min. value $4a+2b-5c$ = ?

$\Rightarrow$ $a+1=11$ $\quad b-3=11$ $\quad c+4=11$
$a=10$ $\quad b=14$ $\quad c=7$

$(4\times10)+(2\times14)-5\times7$
$\Rightarrow 40+28-35$
$= 68-35 = 33$ Ans

MATHS BY DR SINGH (KD CAMPUS)

Scanned by CamScanner

TYPE-3

Que: ax^2+bx+c find max = ? and min = ?

ax^2+bx+c → minimum value = $\frac{4ac-b^2}{4a}$ $a>0$

max value = $\frac{4ac-b^2}{4a}$ $a<0$

$\frac{d}{dx}(ax^2+bx+c)$

$\Rightarrow 2ax+b+0=0 \Rightarrow 2ax=-b \Rightarrow x=-\frac{b}{2a}$ Ans

Que: $4x^2-16x-17$ find min value = ?

Way-I

$\frac{d}{dx}(4x^2-16x-17)$

$\Rightarrow 8x-16=0$

$\Rightarrow 8x=16$

$x=2$ → min point

$4\times2^2-16\times2-17$

$\Rightarrow 4\times4-32-17$

$= 16-49$

$= -33$ Ans

Way-II

$4x^2-16x-17$

ax^2-bx+c

$\Rightarrow \text{min} = \frac{4ac-b^2}{4a}$

$\Rightarrow \frac{4\times4\times-17-16\times16}{4\times4}$

$= \frac{16(-17-16)}{16} = -33$ Ans

MATHS BY DP SINGH (KD CAMPUS)

Scanned by CamScanner

Find min value :-

1) $x^2 - 18x + 32$

Way-I ⇒ $\frac{d}{dx}(x^2 - 18x + 32)$

OR

⇒ $\boxed{x = \frac{-b}{2a}}$

⇒ $x = \frac{-(-18)}{2\times1}$ = $x = \frac{18}{2} = 9$

⇒ $9^2 - 18\times9 + 32 = 81 - 152 + 32 = 113 - 152 = -49$ Ans

Way II ⇒ $\frac{4ac - b^2}{4a}$ ⇒ $\frac{4\times1\times32 - 18^2}{4\times1}$

⇒ $\frac{128 - 18\times18}{4}$ ⇒ $\frac{128 - 324}{4} = \frac{-196}{4}$

$= -49$ Ans

Way III

$x^2 - 18x + 32$

$(x-16)(x-2)$ ⇒ $\frac{-16-2}{2} = \frac{-18}{2} = -9$ ⇒ यदि value (-) में हो तो x की value (+) में रखेंगे।

⇒ $(9-16)(9-2)$ ⇒ $-7\times7 = -49$ Ans

Find min. Value :

1) $(x-3)(x-9)$ ⇒ $\frac{-3-9}{2} = \frac{-12}{2} = -6$

⇒ $(6-3)(6-9)$ ⇒ $3\times-3 = -9$ Ans

2) $(x+3)(x-7)$ ⇒ $\frac{3-7}{2} = \frac{-4}{2} = -2$

⇒ $(2+3)(2-7)$ ⇒ $5\times-5 = -25$ Ans

3) $(x+4)(x-5)$ ⇒ $\frac{4-5}{2} = \frac{-1}{2}$

⇒ $(\frac{1}{2}+4)(\frac{1}{2}-5)$ ⇒ $\frac{9}{2}\times\frac{-9}{2} = \frac{-81}{4}$ Ans

4) $(x-2)(x-3)$ $\frac{-2-3}{2} = \frac{-5}{2}$ ⇒ $(\frac{5}{2}-2)(\frac{5}{2}-3)$

⇒ $-\frac{1}{2}\times\frac{1}{2} = -\frac{1}{4}$ Ans

MATHS BY DP SINGH (KD CAMPUS)

Scanned by CamScanner

find max. value :

$19 - 4x - x^2$

$\Rightarrow$ max $= \dfrac{4ac - b^2}{4a}$

$= \dfrac{4 \times -1 \times 19 - 16}{4 \times -1} = \dfrac{-52 - 16}{-4} = \dfrac{-68}{-4} = 17$ Ans

SSC. Q. $(x-2)(x-9)$ = find min = ?

$= \dfrac{-11}{2} \Rightarrow \left(\dfrac{11}{2} - 2\right)\left(\dfrac{11}{2} - 9\right)$

$= \dfrac{7}{2} \times \dfrac{-7}{2} = -\dfrac{49}{4}$

Q. $a+b+c = 9$ find max. value of $a^2+b^2+c^2 = ?$

$3+3+3$

$\Rightarrow 3^2 + 3^2 + 3^2 = 9 + 9 + 9 = 27$ Ans

Q. if $x = \dfrac{4ab}{a+b}$ than $\dfrac{x+2a}{x-2a} + \dfrac{x+2b}{x-2b}$ (LCM) $\Rightarrow \dfrac{4ab}{2ab} = 2$

Q. if $x = \dfrac{2\sqrt{5}}{\sqrt{3}+\sqrt{2}}$ than $\dfrac{x+\sqrt{2}}{x-\sqrt{2}} + \dfrac{x+\sqrt{3}}{x+\sqrt{3}} \Rightarrow$

Q. if $x = \dfrac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ than $\dfrac{x+\sqrt{20}}{x-\sqrt{20}} + \dfrac{x+\sqrt{12}}{x-\sqrt{12}}$ (LCM) $\Rightarrow \dfrac{4\sqrt{15}}{\sqrt{60}} = \dfrac{4\sqrt{15}}{2\sqrt{15}} = 2$

MATHS BY DP SINGH (KD CAMPUS)

Scanned by CamScanner